

# Wind/Diesel Hybrid Technology for International Development: Opportunities and Constraints

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*Prepared for*

US National Renewable Energy Laboratory  
(NREL)

## Wind-Diesel 2004

***A GVEP Partner Event***

September 29-30, 2004

Alyeska Prince Hotel

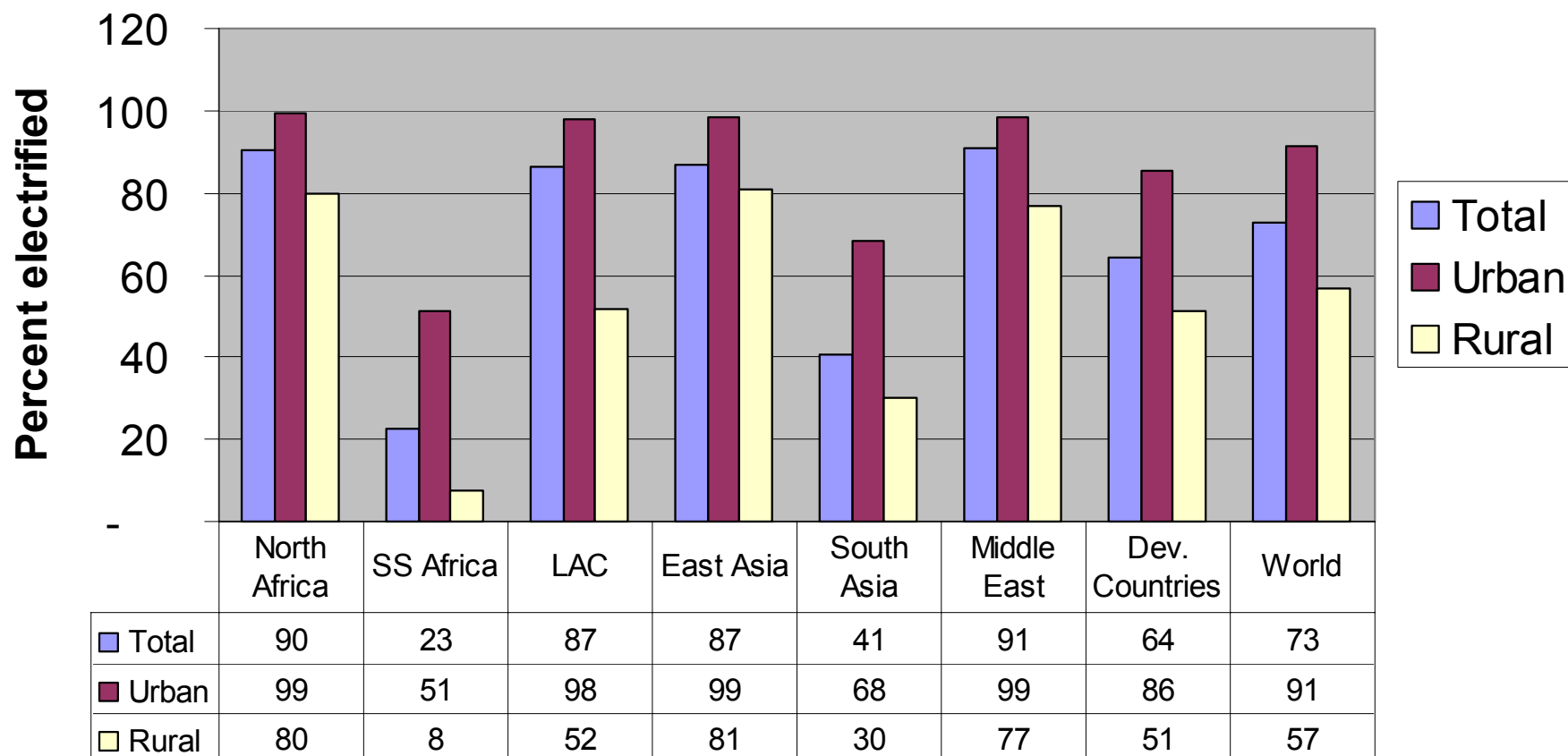
Girdwood, Alaska



# Why consider wind/diesel hybrids for international development?

- 1.6 billion people and several hundred thousand villages lack meaningful electricity services;
- W/D can supply 24-hour electricity and thermal energy for small premium over part-time evening power from diesel gensets
- ✓ *Day-time power facilitates social and economic development*
- ✓ *Low-carbon options (50% - 85% from renewables)*
- Commercially available (with warranties and caveats)

## Urban and Rural Electrification (year 2000)



Source: World Bank (Jamal Saghir, 2002)

# Part 1: Roles of the World Bank Group and other development assistance agencies

# Shall we dance?

International Financial Institutions (IFIs) and Development Agencies

- *Multilateral Dev Banks*
- *UN Agencies*
- *Bilateral AID agencies*
- *Global Environment Facility (GEF)*

←  
Requests



→  
Support

Developing Country Stakeholders

- *Ministries*
- *Utilities*
- *Communities*
- *Politicians*
- *More ...*

World Bank *Poverty Reduction Strategy Papers (PRSP)* and *Country Assistance Strategies (CAS)*

# The World Bank Group

IBRD	International Bank for Reconstruction and Development <i>Loans, guarantees and non-financial assistance for economic and social development</i>
IDA	International Development Agency <i>Donor contributions \$80 B/year for concessional lending: 80 poorest countries (most in sub-Saharan Africa)</i>
IFC	International Finance Corporation <i>Private sector lending, investment, guarantees, advisory services, risk underwriting for private sector</i>
MIGA	Multilateral Investment Guarantee Agency <i>Non-financial risk guarantees to foreign investors</i>
ICSID	International Center for the Settlement of Investment Disputes

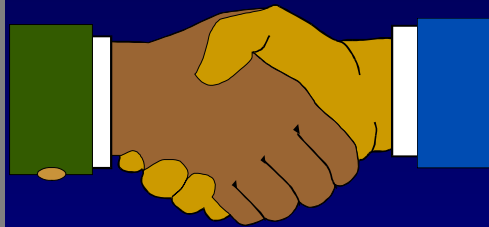
# World Bank Energy Strategy

## The Energy-Poverty Reduction Linkages

### Energy Vision

- Transition from traditional to modern energy
- Efficient supply and use of energy
- Environmentally sustainable supply and use of energy
- Consumer choice of energy services and suppliers
- Positive contribution to macro/fiscal stability

### *Bank's Energy Strategy*



### Poverty Reduction

- Expand **economic opportunities** through increases in productivity
- Empower through access to **communications** and **education** services
- Improve **living conditions** through illumination of homes, cleaner fuels for cooking and heating indoors, and reduced emissions outdoors

The World Bank Group has made a commitment to expanded support for renewables in all of its client countries.

This report was released at the *Renewables2004* conference in Bonn, June 2004

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[www.worldbank.org/energy](http://www.worldbank.org/energy)

# RENEWABLE ENERGY FOR DEVELOPMENT

THE ROLE OF THE  
WORLD BANK GROUP



## World Bank Group Renewable Energy and Energy Efficiency Commitments (millions of U.S. dollars)

Sources		<i>Amounts committed since 1990</i>		
		Total	Renewable energy	Energy efficiency
<b>Direct investment</b>				
World Bank (IBRD and IDA) <sup>a</sup>		3,054	1,320	1,734
IFC <sup>b</sup>		845	752	93
GEF <sup>c</sup>		1,057	694	363
<b>Financing that leverages investments<sup>d</sup></b>				
IBRD Carbon Finance Business	<i>Funds approved or under management</i>	410	n.a.	n.a.
	<i>Funds committed</i>	295	234	61
IFC Carbon Finance Business		55	n.a.	n.a.
MIGA <sup>e</sup>		600	600	0



Internationale Konferenz  
für Erneuerbare Energien, Bonn  
International Conference  
for Renewable Energies, Bonn

# *Renewables2004* political declaration

Part 7: Ministers and Government Representatives emphasize the need for additional targeted research and development, especially by developed countries, including indigenous research and technology development in developing countries and economies in transition [former USSR].

Emphasis should be on affordability & cost reduction, on innovative business and financing models and on cost-effective consumer-friendly cost recovery models, recognizing that different renewable technologies offer different opportunities and face different constraints.

## World Bank Group commitment to renewables and efficiency in *International Plan of Action*

- Contribute to the challenges of eradicating energy poverty through enhanced economic growth and improving the environment
- Work in *partnership with the global community* to lead to a transition to cleaner energy environment.
- ➔ Ensure that *renewable energy and energy efficiency are seen as economically viable and essential ingredients* in the energy choices of our member nations, not marginal considerations.

## World Bank Group commitment to renewables and efficiency in *International Plan of Action*

- Increase World Bank Group staff capacity, resources, and incentives to assist WBG country teams to succeed in renewable energy and energy efficiency projects, as well as more rapidly transfer best practice across sectors and regions.
- Commit – with the concurrence of the World Bank Group Board of Directors – to a target of at least *20 percent average growth annually in both World Bank Group renewable energy and energy efficiency commitments over next 5 years.*

# World Bank Group Scale-up Strategy

- Access to modern energy services
  - Urban, peri-urban, and rural
  - Electricity and modern fuels (gaseous, liquid, and solids)
- Renewables\* -- expanding / accelerating applications in WBG client countries
  - Grid-connected
  - Isolated minigrids
  - Dispersed units and systems
- \* Solar, wind, hydro, biomass, geothermal *[hybrids remain to be explicitly identified / incorporated]*



Global Action for  
Renewable Energy



As the chief provider of funding for renewable energy projects in developing countries, the GEF is having a significant effect on accelerating the development of such energy.

A major focus of the GEF's renewable energy portfolio is *reducing long-term technology costs through demonstration and commercialization.*

[www.thegef.org](http://www.thegef.org) or [www.gefweb.org](http://www.gefweb.org)

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# Global Village Energy Partnership (GVEP)

- Direct outgrowth of NREL Village Power program and international village power conferences
- Created Sept. 2002 at World Summit on Sustainable Development (Johannesburg)
- Open to all people and organizations focused on bringing modern energy services to unserved / underserved communities
- *WD community members should join as GVEP partners* [www.gvep.org](http://www.gvep.org)



# GVEP Objectives

- *Catalyze* country commitments to village energy programs, and guide policies and investments
- *Bridge* the gaps among investors, entrepreneurs, and end users in design, installation and operation of replicable energy-poverty projects.
- *Facilitate* policy and regulatory frameworks to scale up availability of energy services.
- Serve as *marketplace* for information and best practices on effective energy poverty projects and programs.
- *Create* and maintain effective coordination mechanism for addressing energy-poverty needs.

# What needs to be done

- Commercialization support needs to be extended to wind and WD hybrids
  - **IFC**: proactive support for commercial application (1 MW PV in Philippines, utility-scale fuel cells, *no hybrids yet*)
  - **GEF**: move from small PV focus to renewables for village power, island and regional minigrids [partnering with world bank, UNDP, UNEP executing agencies] *and* support W/D hybrids
  - **IFIs and national development banks**: build capacity to lend for renewables

# Bridging the gap: wind-diesel and international development communities

- Awareness and information: web site(s), full-color brochure and application bulletins, in-country workshops (e.g., GVEP), videos
- Capacity building: Training programs and internships for DC\* energy and development professionals, financial institutions, development stakeholders
- Pilot [finding the way] projects in key developing countries

\* Developing Country (and also Washington, DC)